CHAPTER 8
TYPES OF MISSIONS

All fire missions, except final protective fires, begin with the GRID, SHIFT, or POLAR switches. The needed elements of the fire request are entered into the MBC. The WPN/AMMO switch is used to identify the section and the adjusting piece. The firing data are displayed after pressing the compute switch.

8-1. GRID MISSION

The GRID mission switch is used to start a fire mission when the target is located with grid coordinates.

a. The MBC operator presses the GRID key (red) to start the GRID menu. The FR GRID is displayed. **Press SEQ switch**.

(1) Enter FO call sign W/12. (This entry may be omitted.) When an FO call sign is entered, enter it in the FO LOC MENU (INITIALIZATION). In this situation, W/12 is entered. **Press SEQ switch**.

(2) MSN:1 TN:AA0001 is displayed indicating the first mission out of a possible three. The display also shows the target number assigned to this mission by the MBC. **Press SEQ switch**.

(3) Enter the OT direction, if known. If it is not known, the GT may be selected using display switch 1. When this entry is omitted, the MBC automatically inputs the GT direction, and in this situation the OT direction is DIR:0500. **Press SEQ switch**.

(4) Enter the target's grid E:06670 N:48832. **Press SEQ switch**.

(5) Enter the altitude, if known. ALT:0600. **Press SEQ switch**. The ready light will be displayed.

b. The MBC operator selects the WPN/AMMO switch (red).

(1) Sequence past the following:

- FO:W/12\- (FO calling in the fire mission.)
- MSN:1 TN:AA0001 (This is the mission and target number assigned to the mission.)

(2) Enter the adjusting weapon. WP:A2

NOTE: Once the firing section is selected, the weapon type is displayed along with the adjusting weapon. (107C WPN:A2)

Press SEQ switch.

(3) Review shell and fuze combination. SH/FZ:HE PD. If other combinations are needed, use display switch 3 for shell changes and display switch 4 for fuze changes.

(4) Sequence past ELEV:0800 or (CHG: , for 81 mm) to READY.

NOTE: The MBC selects the lowest charge possible, or the operator can manually input a charge of his choice.

c. The MBC operator pushes the COMPUTE switch (green) to receive firing date.

(1) AF STD RP , this display indicates the following:
- Method of control used: AF = Adjust Fire or FFE = Fire For Effect.
- The type of MET : STD = standard or CURR = current.
- Registration point when used.

NOTE: When the COMPUTE switch is pressed before the WPN/AMMO switch, the computer automatically enters the WPN/AMMO menu.

Press SEQ switch.

(2) Review deflection and charge. A2DF:2649 CH:17 1/8
Press SEQ switch.

(3) Review fuze setting and elevation. A2FS: , EL:0800

NOTE: The fuze setting applies only to the fuzes that require a time setting.

Press SEQ switch.

(4) Time of flight is displayed. A2 TOF:28.0
Press SEQ switch.

(5) READY is displayed.

d. The MBC operator pushes the SFTY DATA switch (orange) to receive safety information.

(1) RN:3238 AZ:0987 This display indicates the following:
- Range from the gun position to the target.
- Azimuth from the gun position to the target.

NOTE: At this point, it is not necessary to continue in the SFTY DATA menu.

(2) Press BACK switch (green) to READY.

e. The MBC operator pushes the XMIT switch (green) to receive format messages to the observer.

(1) Press display switch 1 under MTO, MSN:1 **TN:AA0001** is displayed.

NOTE: In most cases angle T information is the only concern.

(2) Press the SEQ switch 11 times to receive the angle T. **ANG T:0300MILS** is displayed.

(3) An option of exiting out of this menu is to press the MSN switch (light green), and then press the BACK switch. **READY** is now displayed.

f. The MBC operator must now wait for FO adjustments (if any). To make FO adjustments, the MBC operator must do the following:
- Press ADJ switch (red). **ADJ MPI** is displayed.
- Press display switch 1 under ADJ switch. **ENT REV** is displayed.
  —To enter adjustments, select ENT.
  —To review the last adjustment, select REV.
- Press display switch 1, ENT. **ADJUST FO:W/12\-** is displayed.

Press SEQ switch.

(1) MSN:1 **TN:AA0001** is displayed (mission and target number assigned to mission).

Press SEQ switch.

(2) REG/MET: NO is displayed (no current registration and or MET data apply to this mission).

Press SEQ switch.

(3) **MET:STD** is displayed (MET to be applied to this mission will be standard MET).

Press SEQ switch.

(4) **GT DIR:0987** is displayed (FO's direction to the target).

NOTE: During the initial input of the mission, the MBC operator bypasses the direction entry. The direction shown is the gun-target (GT) direction, also known as the initial azimuth. At this point, the MBC operator ensures the FO's direction is shown. To clear the portion of the display showing the direction, press display switch 3 under the flashing display cursor or press the CLEAR ENTRY switch once to clear a digit at a time. Once the GT azimuth is cleared, the FO's direction (0500) may be inserted.

Press SEQ switch. **L R DEV** is displayed.

(5) Enter the lateral deviation adjustmant (if any) by selecting the corresponding display switch under the deviation direciton letter. Follow the entry with the number of meters to deviate in lateral adjustment. Insert R0050.

Press SEQ switch. + - RN: is displayed.

(6) Enter the range adjustment (if any), by selecting the corresponding display switch under the range adjustment letter. Follow the entry with the number of meters to adjust in range. Insert -0050.

Press SEQ switch. HGT: MTR is displayed. (Height entries are in meters. This can be changed to feet by pressing display switch 2 and selecting FT [display switch 2].)

Press SEQ switch. U D HT: is displayed.

(7) Enter the height adjustment (if any), by selecting the corresponding display under the height adjustment letter. Follow the entry with the number of meters (or feet) to adjust in height.

g. The MBC operator pushes the COMPUTE switch (green) to receive firing data.

(1) **AF STD RP** is displayed.

Press SEQ switch.

(2) **A2DF:2491 CH:10 1/8** is displayed.

Press SEQ switch.

(3) **A2FS: . EL:0800** is displayed.

Press SEQ switch.

(4) **A2 TOF:27.9** is displayed.

Press SEQ switch. READY is displayed.

Once all adjustments have been made or the FO requests FFE, the MBC operator decides how to engage the target. Based on the information given by the FO in the call for fire, he must use the TFC key.

h. The MBC operator presses the TFC switch (red).

(1) **TFC FO:W/12\-** (FO calling in the fire mission).
Press SEQ switch.

(2) **MSN:1 TN:AA0001** (mission and target number assigned to mission).
Press SEQ switch.

(3) **SHEAF:PRL** (sheaf type prefer by FDC for this mission; this can be changed when necessary).
Press SEQ switch.

(4) **CON:AF** (method of control; this can be changed when necessary). **ENTER FFE**
Press SEQ switch.

(5) **GUNS:A2 13** (section and weapons assigned to FFE; this can be changed when necessary).
Press SEQ switch.

(6) **REG/MET:NO** (no current registration and or MET data apply to this mission; this can be changed when necessary).
Press SEQ switch.

(7) MET:STD (MET to be applied to this mission will be standard MET; this can be changed when necessary).
Press SEQ switch.

(8) **PUSH COMPUTE** is displayed.

i. The MBC operator presses the COMPUTE switch (green) to receive firing data.
Press SEQ switch to receive firing data for each gun.

NOTE: Once EOM is received, the MBC operator obtains the burst point (BP) coordinates, they are 06691 48764. Do this by using the SFTY DATA switch.

j. The MBC operator presses the **EOM switch** (green) to end the mission.

- EOM (ends the mission without saving).
- EOMRAT (ends the mission and records as target/known point).

NOTE: The flashing red light over the SEQ switch indicates additional information is available for the current menu or display.

- EOMFPF (ends the mission and records as FPF).

k. **PRESS EOM** (green key), then **EOMRAT**, sequence and save as known point 00. Now sequence to ready.

8-2. SHIFT MISSION

The SHIFT mission switch is used to initiate a fire request that uses the shift method of target location.

a. The MBC operator presses the **SHIFT switch**. **FT SHIFT** is displayed.
Press SEQ switch. FO:/00\- is displayed.

(1) Enter FO call sign (W12).
Press SEQ switch. FROM:TGT KNPT is displayed.
(2) Select point to shift from (target or known point) (ENTER KP00).
Press SEQ switch. GT DIR: is displayed.
(3) Enter direction (from the call for fire) (DIR 0500).
Press SEQ switch. MSN:* TN:****** is displayed. (* denotes the target number assigned by the MBC.)
Press SEQ switch. L R DEV is displayed.
(4) Enter the lateral deviation correction that applies (LO500).
Press SEQ switch. + - RN: is displayed.
(5) Enter the range correction that applies (-0100).
Press SEQ switch. U D HGT: is displayed.
(6) Enter the altitude correction that applies (U100).
Press SEQ switch. READY is displayed.

b. The MBC operator presses the WPN/AMMO switch. **WPN/AMMO** is displayed.
Press SEQ switch. FO:*/\-** is displayed.
Press SEQ switch. MSN:* TN:****** is displayed.
Press SEQ switch. WPN: is displayed.
(1) Enter the adjusting weapon. **WPN:** (A2)**
Press SEQ switch. SH/FZ: HE PD is displayed.
(2) Change shell and fuze combination if needed.
Sequence past **CHG**: to **READY**.

c. The MBC operator pushes the COMPUTE switch to receive firing data.
(1) Sequence past **AF STD RP**.
(2) Review deflection and charge. **A2DF:2762 CH:15/6**
Press SEQ switch.
(3) Review fuze setting and elevation. **A2FS: . EL:0800**
Press SEQ switch.
(4) Time of flight is displayed. **A2 TOF:26.0**
Press SEQ switch.
(5) **READY** is displayed.

d. The MBC operator pushes the SFTY DATA switch to receive safety information.
Review range and azimuth. **RN:2916 AZ:0872**
Press BACK switch to **READY**.

e. The MBC operator pushes the **XMIT** switch to receive format message to observer.
(1) Press display switch 1 under MTO.
(2) Press the **SEQ** switch 11 times to receive the angle T. **ANG T:0200 mils**
(3) To exit out of this menu, press MSN switch (light green) and then press the BACK switch. **READY** is displayed.

f. The MBC operator waits for FO adjustments (if any). To make these adjustments, the operator must:
(1) Press the **ADJ** switch. **ADJ MIP** is displayed.
(2) Press display switch 1 under ADJ. **ENT REV** is displayed.
(3) Press display switch 1. **ENT** is displayed.
(4) Sequence to GT. **DIR:****** (FO's direction to the target).

Press SEQ switch.

(5) **L R DEV** is displayed. **ENTER L0050**

Press SEQ switch.

(6) **+ - RN**: is displayed. **ENTER +0050**

Press SEQ switch.

(7) **HGT:MTR** is displayed. (Height entries appears in meters. This can be changed to feet by pressing display switch 2 and selecting FT [display switch 2].)

Press SEQ switch.

(8) **U D HT**: is displayed. (Enter the height adjustment.) **D0050**

Press SEQ switch.

(9) **READY** is displayed.

g. The MBC operator pushes the COMPUTE switch to receive firing data.

(1) Sequence past: **AF STD RP**

(2) Review deflection and charge. **A2DF:2786 CH:15/5**

Press SEQ switch.

(3) Review fuze setting and elevation. **A2FS . EL:0800**

Press SEQ switch.

(4) **TIME OF FLIGHT** is displayed. **A2 TOF:26.4**

Press SEQ switch.

(5) **READY** is displayed.

h. Once all adjustments have been made or the FO requests FFE, the MBC operator decides how to engage the target. Based on the information given by the FO in the call for fire, the MBC operator presses the TFC switch.

(1) **TFC FO:*/**\-** (FO calling in the fire mission).

Press SEQ switch.

(2) **MSN:* TN:******** (mission and target number assigned to mission).

Press SEQ switch.

(3) **SHEAF:PRL** (this is the sheaf type preferred by the FDC for this mission; it can be changed when necessary).

Press SEQ switch.

(4) **CON:AF** (this is the method of control; it can be changed when necessary). **ENTER FFE**

Press SEQ switch.

(5) **GUNS:A2 13** (this is the section and weapons assigned to the FFE; it can be changed when necessary).

Press SEQ switch.

(6) **REG/MET:NO** (this is the current registration and or MET data that apply to this mission; it can be changed when necessary).

Press SEQ switch.

(7) **MET:STD** (this is the standard MET to be applied to this mission; it can be changed when necessary).

Press SEQ switch.

(8) **PUSH COMPUTE** is displayed.

i. The MBC operator presses the **COMPUTE** switch to receive firing data. Then presses the **SEQ** switch to receive the firing data for each gun.

j. The MBC operator presses the **EOM** switch (green) to end the mission.
(1) EOM (ends the mission without saving).
(2) EOMRAT (ends the mission and records as target/known point).

NOTE: The flashing red light over the SEQ switch indicates additional information is available for the current menu or display.

(3) EOMFPF (ends the mission and records as FPF).

k. Press **EOM**, then **EOMRAT** sequence and save as known point 01. Now sequence to ready.

8-3. POLAR MISSION

The polar switch is used to initialize a mission that uses the polar method of target location.

a. The MBC operator presses the **POLAR** switch. **NORMAL LASER** is displayed. The FO conducts this mission in the normal mode. The MBC operator selects **NORMAL**.

- NORMAL (this is a method of target location, using a map or any nonlaser device).
- LASER (this is a method of target location, using laser equipment).

(1) FR POLAR is displayed.
Press SEQ switch. **FO:/00\-** is displayed.
(2) Enter FO call sign. W/12
Press SEQ switch. **MSN:* TN:******** is displayed. (* denotes the target number assigned by the MBC.)
Press SEQ switch. **DIR:** is displayed.
(3) Enter direction (from the call for fire). **DIR:0800**
Press SEQ switch. DIS: is displayed.
(4) Enter the distance (from the call for fire). **DIS:2000**
Press SEQ switch. U D HGT: is displayed.
(5) Enter altitude correction to apply. **D050**
Press SEQ switch. READY is displayed.

b. The MBC operator presses the WPN/AMMO switch. **WPN/AMMO** is displayed.
Press SEQ switch. FO:*/\- is displayed**. (* denotes the FO's call sign that was entered in step 1).
Press SEQ switch. MSN:* TN:****** is displayed.
(1) Enter the adjusting weapon. **WPN:** (A2)**
Press SEQ switch. SH/FZ: HE PD is displayed.
(2) Change shell and fuze combination if needed.
Press SEQ switch. **CHG:** to **READY**.

c. The MBC operator pushes the **COMPUTE** switch to receive firing data.
(1) Sequence past: **AF STD RP**
(2) Review deflection and charge. **A2DF:2491 CH:1011**
Press SEQ switch.
(3) Review fuze setting and elevation. **A2FS . EL0800**
Press SEQ switch.
(4) Time of flight is displayed. **A2 TOF:23.0**

Press SEQ switch.

(5) **READY** is displayed.

d. The MBC operator pushes the **SFTY DATA** switch to receive safety information.

(1) Review range and azimuth. **RN:2121 AZ:1146**

(2) Press **BACK** switch to **READY**.

e. The MBC operator pushes the **XMIT** switch to receive format messages to the observer.

(1) Press display switch 1 under MTO.

(2) Press the **SEQ** switch 11 times to receive the angle T. **ANG T:0300 MILS**

(3) To exit out of the menu, press the **MSN** switch (light green) and then press the **BACK** switch. **READY** is displayed.

f. The MBC operator must wait for FO adjustments (if any). To make adjustments, the MBC operator must:

(1) Press the **ADJ** switch. **ADJ MIP** is displayed.

(2) Press display switch 1 under ADJ. **ENT REV** is displayed.

(3) Press the display switch 1, **ENT**.

(4) Sequence to **GT DIR:****** (FO's direction to the target).
Press SEQ switch.

(5) **L R DEV** is displayed. **ENTER L0050**
Press SEQ switch.

(6) **+ - RN** is displayed. **ENTER +0025**
Press SEQ switch.

(7) **U D HT** is displayed. SEQUENCE PAST THIS DISPLAY.
Press SEQ switch.

(8) **READY** is displayed.

g. The MBC operator pushes the COMPUTE switch to receive firing data.

(1) Sequence past: **AF STD RP**

(2) Review deflection and charge. **A2DF:2517 CH:1011**
Press SEQ switch.

(3) Review fuze setting and elevation. **A2FS: . EL:0800**
Press SEQ switch.

(4) Time of flight is displayed. **AZ TOF:23.0**
Press SEQ switch.

(5) **READY** is displayed.

h. Once all adjustments have been made or the FO requests FFE, the MBC operator decides how to engage the target. Based on the information given by the FO in the call for fire, he must use the TFC key. The MBC operator must:

(1) Press the **TFC** key. **TFC FO:*/**\-** (FO calling in the fire mission).
Press SEQ switch.

(2) **MSN:* TN:******** (mission and target number assigned to mission).
Press SEQ switch.

(3) **SHEAF: PRL** (sheaf type preferred by the FDC for this mission; it can be changed when necessary).
Press SEQ switch.

(4) **CON:AF** (the method of control; it can be change when necessary). **ENTER FFE**

Press SEQ switch.

(5) **GUNS:A2 13** (section and weapons assigned to the FFE; it can be changed when necessary).

Press SEQ switch.

(6) **REG/MET: NO** (no current registration and or MET data apply to this mission; it can be changed when necessary).

Press SEQ switch.

(7) **MET:STD** (MET to be applied to this mission is standard MET; it can be changed when necessary).

Press SEQ switch.

(8) **PUSH COMPUTE** is displayed.

i. The MBC operator presses compute to receive firing data.
Press SEQ switch. Firing data for each gun is displayed.

NOTE: Once EOM is received, the MBC operator obtains the burst point coordinates. This is accomplished by using the **SFTY DATA** switch.

j. The MBC operator presses the EOM switch (green) to end the mission.
- **EOM** (ends the mission without saving).
- **EOMRAT** (ends the mission and records it as target/known point).

NOTE: The flashing red light over the SEQ switch indicates additional information is available for the current menu or display.

- **EOMFPF** (ends the mission and records it as FPF).

k. Press **EOM** (green key), then EOM 1 display switch under EOM.

8-4. TECHNICAL FIRE CONTROL

Based on information given in the call for fire, the FDC chief/section leader decides how best to engage the target. Once the FO enters the FFE phase, the MBC operator can use the technical fire control (TFC) switch to engage the target (as directed by the FDC order).

a. The TFC control menu allows the FDC to enter or change information for the following default values:

Sheaf: Parallel
Method of control: Adjust Fire
Weapons to fire: Base piece selected
Registration data: NO
MET data: Standard

b. When all of the defaults are acceptable, the TFC switch is not needed. A brief description of the TFC menu abbreviations and their uses follows:

NOTE: Always use the TFC switch whenever using a safety fan and or fire zones.

(1) **SHEAF:PRL**—This is the type of sheaf needed to engage the target. Sheaves selectable within the menu are PRL (parallel), CVG (converge), and SPECIAL.

(2) **CON:AF—CON** stands for control of fires. The multiple choice selections include **AF** (adjusting fire), **FFE** (fire for effect), **DST** (destruction), and **REG** (registration).

NOTE: In the adjust fire mode, the only weapon shown is the same weapon selected through the WPN AMMO switch. When the operator enters FFE, all assigned available weapons in that section are included in the computation of fire data. When control is FFE or DST (destruction), some weapons (not the adjusting weapon) may be deleted by using correction entry.

(3) **GUNS**—This shows which mortars are available for the designated control of fires. For example, if AF appears on the previous screen, the only mortar shown on this display is the piece designated by the MBC operator in the WPN/AMMO menu.

(4) **REG/MET**—If a MET has been entered and made current, this display would show REG/MET: YES. This tells the operator that MET or registration corrections will be applied to the target firing data. If the display shows REG/MET: NO, there are no corrections applied.

(5) **MET:STD**—This tells the operator what type of MET corrections are used for the fire mission. There are two possible types: STD (standard) and CURR (current).

8-5. SHEAVES

The term *sheaf* denotes the lateral distribution of the bursts of two or more weapons firing at the same target at the same time. The distribution of bursts is the pattern of bursts in the area of the target. Normally, all weapons of the platoon/section fire with the same deflection, charge, and elevation. However, since targets may be of various shapes and sizes and the weapons deployed irregularly, it is best to adjust the pattern of bursts to the shape and size of the target.

a. Individual weapon corrections for deflection, charge, and elevation are computed and applied to obtain a specific pattern of bursts. These corrections are called **special corrections**. These corrections are computed and applied based on the target attitude, width, length, and adjusting point.

b. When the mortar section or platoon engages a target, different sheaves can be used. The types of sheaves include the parallel, converged, open, standard, and special (see Chapter 4).

(1) When mortars fire a parallel sheaf, the distance between impacts of rounds is the same as the distance between mortars. The mortars all fire using the same firing data. A parallel sheaf is normally used on area targets.

(2) When mortars fire a converged sheaf, the rounds, fired from two or more mortars, impact on the same point in the target area. This sheaf is normally used on a point target such as a bunker or a machine gun position.

(3) When mortars fire an open sheaf, the distance between impacts of rounds is half again the distance between mortars. Normally, 120-mm mortars are 60 to 75 meters apart, 81-mm and 4.2-inch mortars are 35 to 40 meters apart; thus, in an open sheaf, rounds should land about 60 meters apart. For the 60-mm mortars, which are normally 25 to 30 meters

apart, rounds should land about 45 meters apart. All mortars fire using different deflections. The open sheaf is used when the target is slightly wider than the area a standard sheaf would cover.

(4) When mortars fire a standard sheaf, rounds impact within the total effective width of the bursts, regardless of the mortar locations.

(5) When mortars fire a special sheaf, each mortar has a certain point to engage. The mortars may have different deflections, charges, and elevations. This sheaf is normally used in an attitude mission.

NOTE: When mortars fire an open sheaf or a standard sheaf, the operator must use the special sheaf function and enter the appropriate data to obtain the desired results.

8-6. TRAVERSING FIRE

Mortars use traversing fire when the target is wider than what can be completely engaged by a standard or open sheaf. They engage wide targets using a distributed FFE. Each mortar of the section covers a portion of the total target area and traversing across that area. The mortars are manipulated for deflection between rounds until the number of rounds given in the fire command has been fired.

NOTES:
1. The target attitude should be within 100 mils of the attitude of the mortar section (WPN DATA menu).
2. The attitude of the target should be perpendicular to the gun's direction of fire. When firing at targets with other than perpendicular angles, a combination of traverse and search will result.

a. Upon receiving the call for fire, the section leader/chief computer determines from the size and description of the target that traversing fire will be used to cover the target. He then issues the FDC order (Figure 8-1).

NOTE: Distribution of mortar fire to cover area targets (depth or width) is computed at one round for each 30 meters and four rounds for each 100 meters.

b. When using the information in the call for fire, FDC order, and FO corrections, the FDC computes the data to adjust the base mortar (usually the No. 2 mortar) onto the center mass of the target area. He computes the firing data to center mass. The FDC selects the SFTY DATA switch and records the range and burst point grid coordinate on DA Form 2399 (Figure 8-2).

COMPUTER'S RECORD
For use of this form, see FM 23-91. The proponent agency is TRADOC.

ORGANIZATION	DATE	TIME	OBSERVER ID	TARGET NUMBER
B Co 1/29 IN			D61	CA0701

☑ ADJUST FIRE ☐ FIRE FOR EFFECT
☐ IMMEDIATE SUPPRESSION

GRID: 038 629
OT DIRECTION: 2400
ALTITUDE: 420

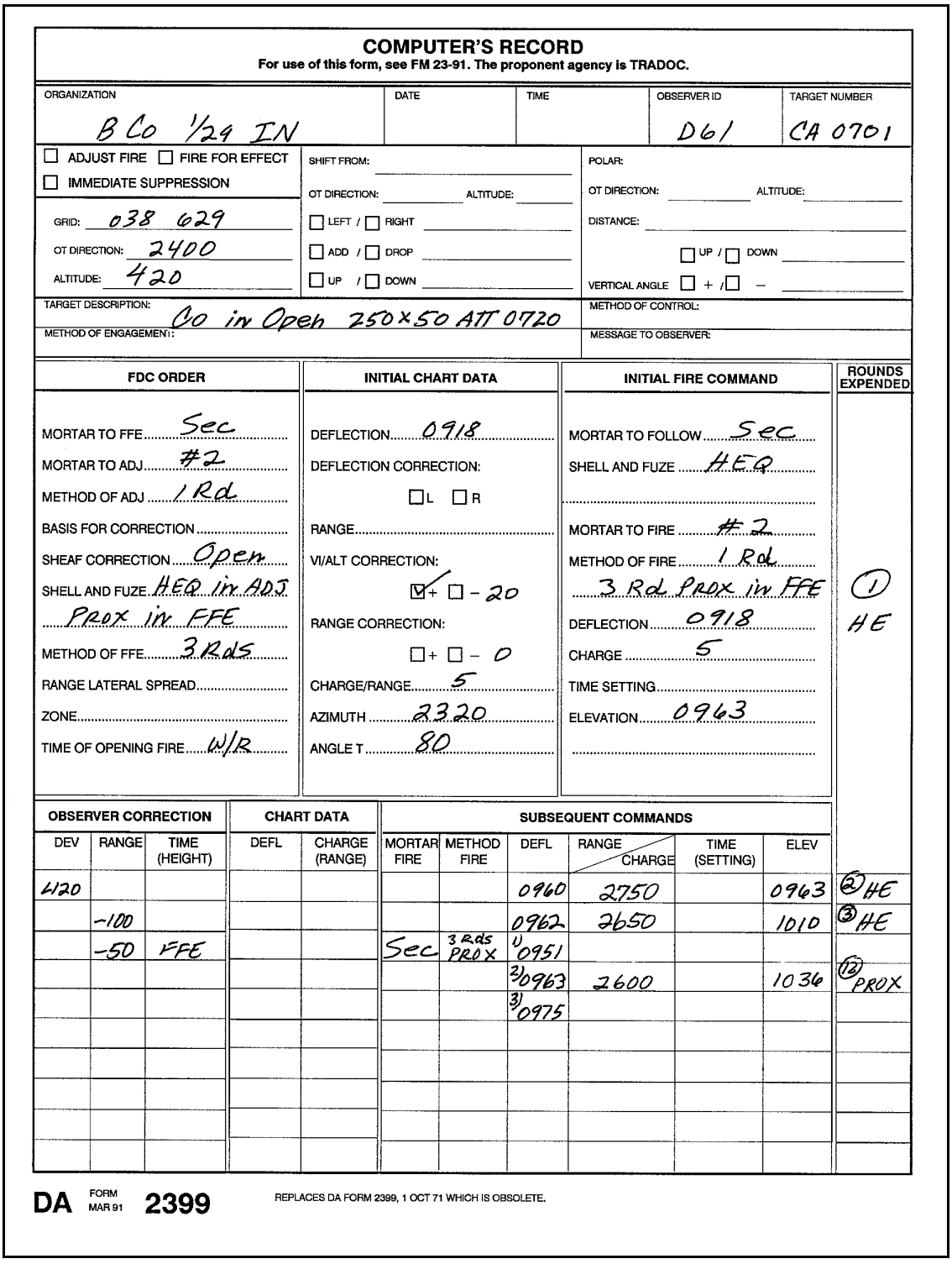
SHIFT FROM:
OT DIRECTION: ALTITUDE:
☐ LEFT / ☐ RIGHT
☐ ADD / ☐ DROP
☐ UP / ☐ DOWN

POLAR:
OT DIRECTION: ALTITUDE:
DISTANCE:
☐ UP / ☐ DOWN
VERTICAL ANGLE ☐ + / ☐ –

TARGET DESCRIPTION: Co in Open 250x50 ATT 0720
METHOD OF ENGAGEMENT:
METHOD OF CONTROL:
MESSAGE TO OBSERVER:

FDC ORDER	INITIAL CHART DATA	INITIAL FIRE COMMAND	ROUNDS EXPENDED
MORTAR TO FFE: Sec	DEFLECTION:	MORTAR TO FOLLOW:	
MORTAR TO ADJ: #2	DEFLECTION CORRECTION:	SHELL AND FUZE:	
METHOD OF ADJ: 1 Rd	☐L ☐R		
BASIS FOR CORRECTION:	RANGE:	MORTAR TO FIRE:	
SHEAF CORRECTION: Open	VI/ALT CORRECTION:	METHOD OF FIRE:	
SHELL AND FUZE: HEQ in ADJ	☐+ ☐–		
PROX in FFE	RANGE CORRECTION:	DEFLECTION:	
METHOD OF FFE: 3 Rds	☐+ ☐–	CHARGE:	
RANGE LATERAL SPREAD:	CHARGE/RANGE:	TIME SETTING:	
ZONE:	AZIMUTH:	ELEVATION:	
TIME OF OPENING FIRE: W/R	ANGLE T:		

Figure 8-1. Call for fire and FDC order completed.



COMPUTER'S RECORD
For use of this form, see FM 23-91. The proponent agency is TRADOC.

ORGANIZATION	DATE	TIME	OBSERVER ID	TARGET NUMBER
B Co 1/24 IN			D61	CA 0701

☐ ADJUST FIRE ☐ FIRE FOR EFFECT
☐ IMMEDIATE SUPPRESSION

GRID: 038 629
OT DIRECTION: 2400
ALTITUDE: 420

SHIFT FROM:
OT DIRECTION: ALTITUDE:
☐ LEFT / ☐ RIGHT
☐ ADD / ☐ DROP
☐ UP / ☐ DOWN

POLAR:
OT DIRECTION: ALTITUDE:
DISTANCE:
☐ UP / ☐ DOWN
VERTICAL ANGLE ☐ + / ☐ –

TARGET DESCRIPTION: Co in Open 250×50 ATT 0720
METHOD OF ENGAGEMENT:
METHOD OF CONTROL:
MESSAGE TO OBSERVER:

FDC ORDER
MORTAR TO FFE: Sec
MORTAR TO ADJ: #2
METHOD OF ADJ: 1 Rd
BASIS FOR CORRECTION:
SHEAF CORRECTION: Open
SHELL AND FUZE: HEQ in ADJ / PROX in FFE
METHOD OF FFE: 3 Rds
RANGE LATERAL SPREAD:
ZONE:
TIME OF OPENING FIRE: W/R

INITIAL CHART DATA
DEFLECTION: 0918
DEFLECTION CORRECTION: ☐L ☐R
RANGE:
VI/ALT CORRECTION: ☑+ ☐– 20
RANGE CORRECTION: ☐+ ☐– 0
CHARGE/RANGE: 5
AZIMUTH: 2320
ANGLE T: 80

INITIAL FIRE COMMAND
MORTAR TO FOLLOW: Sec
SHELL AND FUZE: HEQ
MORTAR TO FIRE: #2
METHOD OF FIRE: 1 Rd
3 Rd PROX in FFE
DEFLECTION: 0918
CHARGE: 5
TIME SETTING:
ELEVATION: 0963

ROUNDS EXPENDED
① HE

OBSERVER CORRECTION			CHART DATA		SUBSEQUENT COMMANDS						ROUNDS EXPENDED
DEV	RANGE	TIME (HEIGHT)	DEFL	CHARGE (RANGE)	MORTAR FIRE	METHOD FIRE	DEFL	RANGE / CHARGE	TIME (SETTING)	ELEV	
L120							0960	2750		0963	② HE
	-100						0962	2650		1010	③ HE
	-50	FFE			Sec	3 Rds PROX	1) 0951				
							2) 0963	2600		1036	⑫ PROX
							3) 0975				

DA FORM MAR 91 2399 REPLACES DA FORM 2399, 1 OCT 71 WHICH IS OBSOLETE.

Figure 8-2. Example of completed DA Form 2399 for adjustment complete.

c. After the adjustment is complete, the FDC must perform the following procedures:

(1) Divide the target into equal segments by dividing the width of the target by the number of mortars in the FFE.

EXAMPLE

target width = 300 meters
number of mortars in the FFE = 3
300/3 = 100 meters each mortar has to cover.

(2) Determine and apply the modification (either +/- RNG correction or left/right DEV correction). Divide the the segment width (100) by 2 to determine the amount of the modification—for example, 100/2 = 50. Use one of the following methods to apply the modification.

(a) Use Table 8-1 to determine the direction (plus or minus) for the modification. As an example, let the GT be 5300 mils, traverse right.

GUN-TARGET AZIMUTH 4901-1499
TRAVERSE LEFT (+)
TRAVERSE RIGHT (-)
GUN-TARGET AZIMUTH 1500-1700
ATTITUDE < 1600
TRAVERSE LEFT (-)
TRAVERSE RIGHT (+)
ATTITUDE > 1600
TRAVERSE LEFT (+)
TRAVERSE RIGHT (-)
GUN-TARGET AZIMUTH 1701-4699
TRAVERSE LEFT (-)
TRAVERSE RIGHT (+)
GUN-TARGET AZIMUTH 4700-4900
ATTITUDE < 1600
TRAVERSE LEFT (+)
TRAVERSE RIGHT (-)
ATTITUDE > 1600
TRAVERSE LEFT (-)
TRAVERSE RIGHT (+)

Table 8-1. Gun-target azimuth chart.

Since the GT azimuth falls in the azimuth block of 4901-1499, the modification will be a plus if traversing left and a minus(-) if traversing right. Since the mortars will traverse right, their modification will be -50.

OR

(b) When the FDC finds itself without the GT AZ chart, an alternative method of computing for the modification is needed. Therefore, draw the situation to help new FDC personnel develop an understanding of how and why the MBC computes for the traverse data.

EXAMPLE (Figures 8-3 through 8-5)

Target = 300 x 50 meters
Attitude (TGT) = 0400 mils
GT AZ (DOF) = 5300 mils
Three-mortar section

Guns must be placed so they are using the direction of the target attitude (400 mils). The FDC determines if it needs a plus or minus correction to get to the *starting point*.

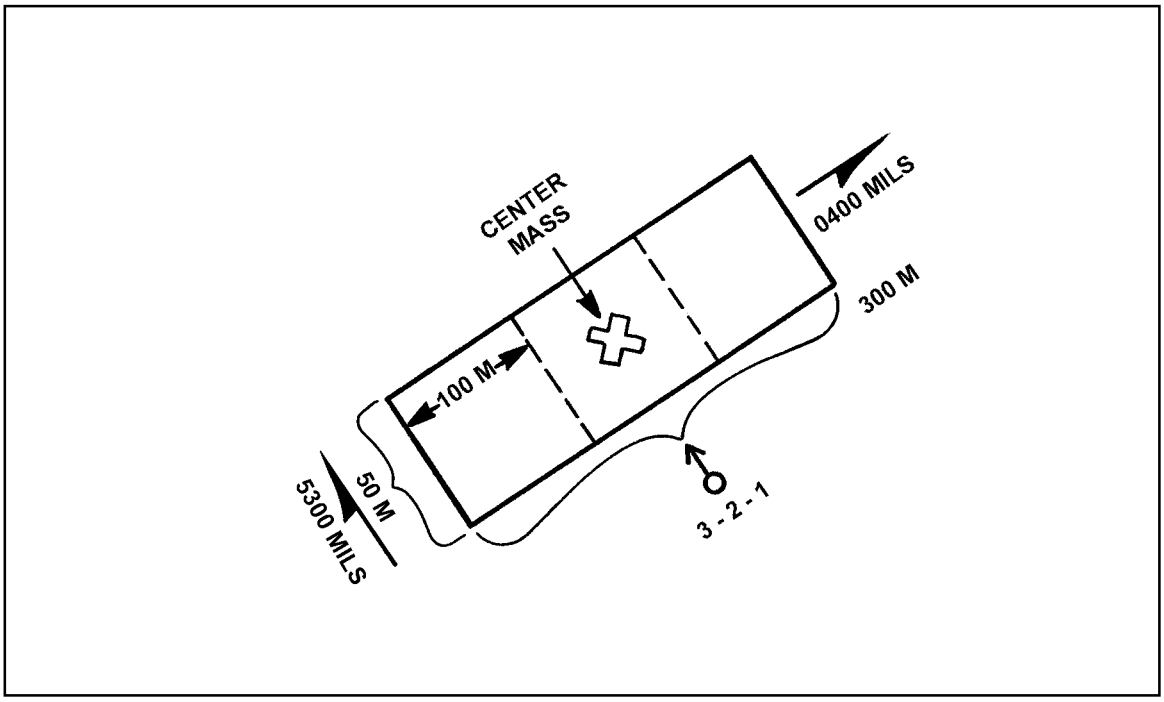


Figure 8-3. Example situation chart number 1.

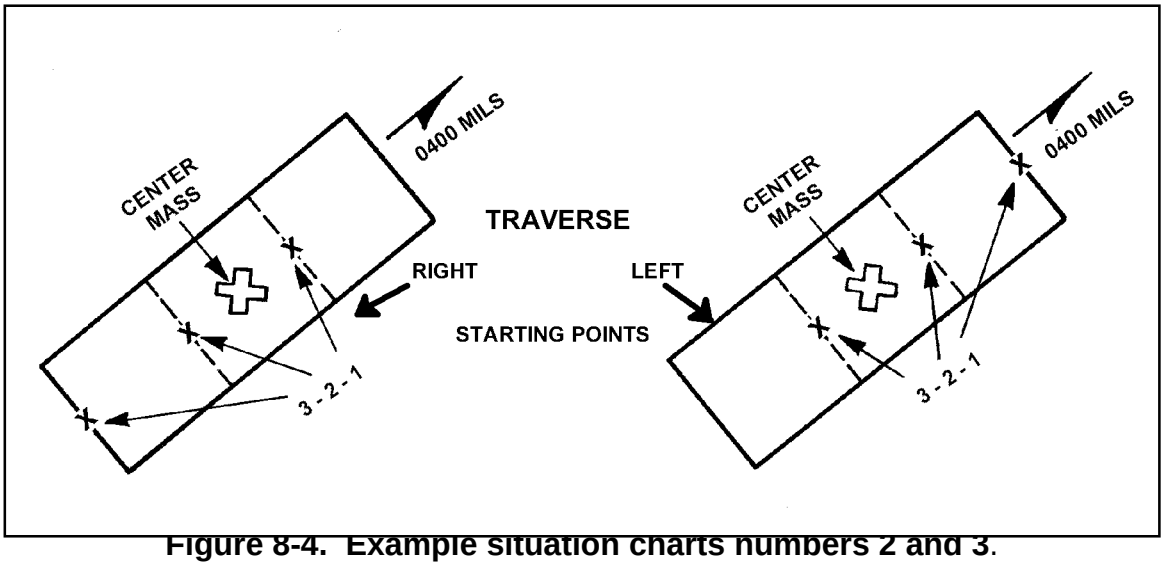


Figure 8-4. Example situation charts numbers 2 and 3.

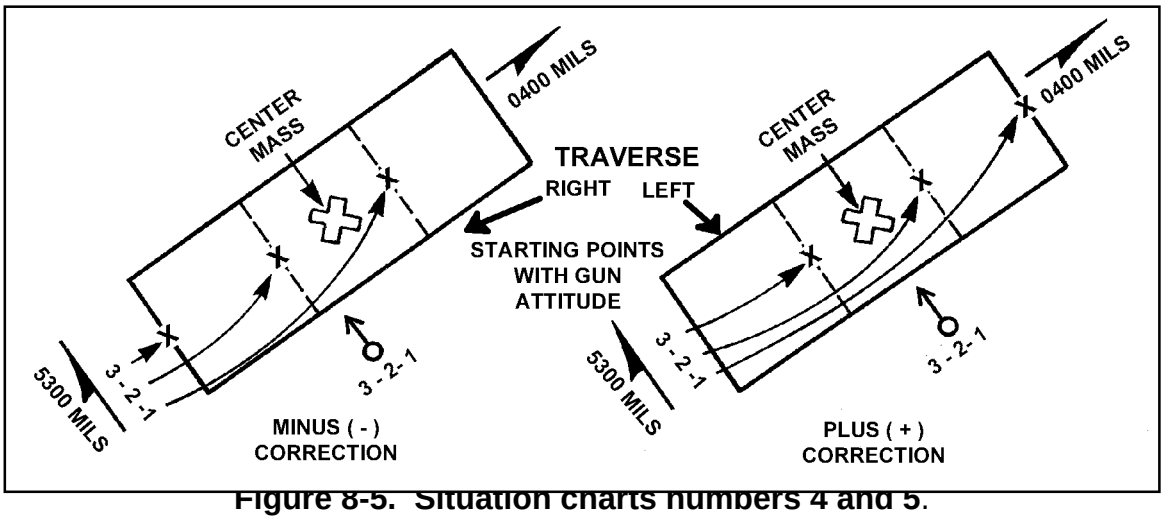


Figure 8-5. Situation charts numbers 4 and 5.

OR

(c) Determine the perpendicular to the attitude (add or subtract 1600 mils; use whichever is closer to the final azimuth of fire) and apply the modification as a left or right correction. When computing for firing data using the perpendicular, copy the range and burst point grid coordinate, and the final azimuth of fire.

(d) Add or subtract 1600 mils to the target attitude. Use the answer that comes closer to the final azimuth of fire for the direction correction in the ADJ menu.

(e) Select the ADJ switch and change the direction to the perpendicular azimuth.

(f) Instead of making a range correction as in the previous examples, make a DEV (deviation) correction. This correction is one-half the distance each mortar must cover.

(g) If traversing left, enter a right DEV correction; if traversing right, enter a left DEV correction.

(3) Once the modification (regardless of the method used) has been entered into the ADJ menu of the MBC, press the TFC switch and change or enter the following data:

(a) Change: SHEAF:PRL to read SHEAF:SPECIAL.

(b) Change: ADJ PT:FLANK to read ADJ PT:CENTER.

(c) Enter target width (total area to be covered in the call for fire) such as 300 x 50 meters.

(d) Enter target attitude such as 400 mils.

(e) Change: CON:AF to read CON:FFE.

(f) Press the COMPUTE switch and receive firing data.

(4) Determine the number of rounds for each segment.

EXAMPLE

Assume that the width of the target is 350 meters. Divide the area into equal segments: 350/3 = 116. Each mortar covers 116 meters of the target area. Multiply the even hundred by 4: 1 x 4 = 4. The remainder of the target width (16 meters) is covered by adding one round. Therefore, rounds for each segment equal 5.

NOTE: Change to 300 x 50 if area is over 300 (350).

(5) Determine the mil width of one segment. If the mil width of one segment is determined, the other segments are the same. Use one of two methods to determine the number of mils for one segment:

(a) In the first method, the start point deflections for all the mortars are given. By comparing the mil difference between either No. 1 mortar and No. 2 mortar or No. 2 mortar and No. 3 mortar (or No. 3 mortar and No. 4 mortar, if available). For example, No. 1 mortar has a deflection of 2719 mils and No. 2 mortar has a deflection of 2773 mils. The mil difference is 54 mils (subtract the smaller from the larger: 2773 - 2719 = 54 mils).

(b) The second method uses the DCT (Figure 8-6) to determine the mil width of one segment. Enter the DCT at the final range, rounded off to the nearest 100. Go across the deflection-in-meters line to the closest meters to cover the segment. The point at which the range line and the deflection line meet is the number of mils that will cover the segment.

RANGE IN METERS	DEFLECTION IN METERS														
	1	10	20	30	40	50	75	100	125	150	175	200	300	400	500
500	3.0	20	41	61	81	102	152	201	250	297	34	388	550	687	800
600	1.7	17	34	51	68	85	127	168	209	250	289	328	472	599	708
700	1.5	15	29	44	58	73	109	145	180	215	250	284	412	529	632
800	1.3	13	25	33	51	64	95	127	158	189	219	250	365	472	569
900	1.1	11	22	34	45	57	85	113	141	168	195	223	328	426	517
1000	1.0	10	20	31	41	51	76	102	127	152	176	201	297	388	473
1100	.93	9	18	28	37	46	69	92	115	138	161	183	271	355	435
1200	.85	8	17	25	34	42	64	85	106	127	148	168	249	328	402
1300	.79	8	16	23	31	39	59	78	98	117	136	155	231	304	374
1400	.73	7	15	22	29	36	55	73	91	109	127	145	215	283	349
1500	.68	7	14	20	27	34	51	68	85	102	118	135	201	265	328
1600	.63	6	13	19	25	32	48	64	80	95	111	127	189	250	309
1700	.60	6	12	18	24	30	45	60	75	90	104	119	178	235	291
1800	.57	6	11	17	23	28	42	57	71	85	99	113	168	223	276
1900	.54	5	11	16	21	27	40	54	67	80	94	107	160	211	262
2000	.51	5	10	15	20	25	38	51	64	76	89	102	152	201	250
2100	.49	5	10	15	19	24	36	48	61	73	85	97	145	192	238
2200	.46	5	9	14	19	23	35	46	58	69	81	92	138	183	228
2300	.44	4	9	13	18	22	33	44	55	66	77	88	132	175	218
2400	.43	4	8	13	17	21	32	42	53	63	74	85	127	168	209
2500	.41	4	8	12	16	20	31	41	51	61	71	81	122	162	201
2600	.39	4	8	12	16	20	29	39	49	59	68	78	117	155	194
2700	.38	4	8	11	15	19	28	38	47	57	66	75	113	150	187
2800	.37	4	7	11	15	18	27	36	45	55	64	73	109	145	180
2900	.35	4	7	11	14	18	26	35	44	53	61	70	105	140	174
3000	.34	3	7	10	14	17	25	34	42	51	59	68	102	135	168
3100	.33	3	7	10	13	16	25	33	41	49	57	66	98	131	163
3200	.32	3	6	10	13	16	24	32	40	48	56	64	95	127	158
3300	.31	3	6	9	12	15	23	31	39	46	54	62	92	123	153
3400	.30	3	6	9	12	15	22	30	37	45	52	60	90	119	149
3500	.30	3	6	9	12	15	22	29	36	44	51	58	87	116	145
3600	.29	3	6	8	11	14	21	28	35	42	49	57	85	113	141
3700	.28	3	6	8	11	14	21	28	34	41	48	55	82	110	137
3800	.27	3	5	8	11	13	20	27	33	40	47	54	80	107	133
3900	.27	3	5	8	10	13	20	26	33	39	46	52	78	104	130
4000	.26	3	5	8	10	13	19	26	32	38	45	51	76	102	127

Figure 8-6. Example of deflection conversion table.

(6) To determine the number of turns it will take to cover one segment, divide the number of mils for each turn on the traversing hand crank by the mil width of one segment—for example, 10 (divide by 5 when using the 120-mm mortar) (number of mils for each turn)/54 = 5.4 (rounded off to the nearest one-half turn) or 5 1/2 turns to cover 116 meters.

(7) To compute the number of turns between rounds, the number of rounds to be fired must be known for each segment (FFE). This information is in the FDC order. To determine the turns between rounds, divide the total turns by the intervals (always one less than the

number of rounds) between rounds—for example, 5 rounds = 4 intervals; 5.5 (total turns)/4 (intervals):

5.5/4 = 1.3 (rounded to nearest 1/2 turn)
= 1/2 turns between rounds

8-7. SEARCHING OR ZONE FIRE

Area targets that have more depth than a standard sheaf covers require that mortars use searching fires to effectively engage these targets. Any target having more depth than 50 meters can be covered by mortars. This is done by either elevating or depressing the barrel during the FFE. In the call for fire, the FO sends the size of the target and the attitude. He gives the width and depth on the attitude of the target. (Attitude is the direction [azimuth] through the long axis of the target.)

a. All mortar systems use *searching fire* with the exception of the 4.2-inch mortar, which uses zone fire to cover the target area. Before determining the search data, the FDC must compute any correction that was sent with the FFE command from the FO. Also, the burst point grid coordinate must be recorded.

(1) Press the ADJ switch and enter the target attitude in place of the direction.

NOTE: Whether searching up or searching down, always determine the firing data for the far edge of the target area first. This saves time if the charge designated at the near edge is different than the one designated at the far edge.

(2) When using searching fire, enter an add correction that is half the total target length. This places the mortars on the far edge of the target.

(3) Compute the firing data for the far edge and record the information.

(4) Enter a correction to place the mortars on the opposite edge of the target. The correction to enter will be a drop, and the distance will be the entire length of the target area.

(5) Compare the charge needed to hit the near edge with the charge needed to hit the far edge of the target. The charge *must* be the same. If they are not, select the charge designated for the far edge by using the WPN/AMMO menu and recompute the near edge firing data.

(6) Determine the number of turns between rounds by determining the mil distance to cover the target area and by dividing it by 10 (approximate number of mils in one turn of the elevation hand crank). Round off the answer to the nearest one-half turn. Compute the distribution of mortar fire to cover area targets (depth or width) at one round for each 30 meters and four rounds for each 100 meters.

(a) Compare the far edge elevation to the near edge elevation and subtract the smaller from the larger.

(b) Divide the mil distance by 10 (divide by 5 for the 120-mm mortar) and round off to the nearest half a turn.

(7) Determine the turns between rounds by dividing the intervals into the turns and by rounding off to the nearest half turn. The intervals are always one less than the number of rounds in the FFE.

b. The 4.2-inch mortar does not fire a search mission the same as the 60-mm, 81-mm, or 120-mm mortars. It does not have the same elevating characteristics as these mortars;

therefore, the 4.2-inch mortar uses *zone fire*. The 4.2-inch mortar platoon/section usually fires two standard zones: a 100-meter zone (three rounds for each mortar) for a platoon-size target, and a 200-meter zone (five rounds for each mortar) for a company-size target. Cover larger zones by firing more rounds.

c. These are the procedures used when using an MBC.

(1) The FO adjusts to center mass of the target area. He calls for an FFE (his last correction may also include the FFE command). The FDC determines the center mass of the target based on the FO's last correction and determines the burst point.

(2) The FDC obtains the information for the zone using the MBC by:

(a) 100-meter zone.

- Entering the ADJ menu.
- Entering an adjustment of +50 (far edge).
- Writing down all the firing data.
- Entering the ADJ menu again.
- Entering an adjustment of -100 (near edge).
- Writing down all the firing data.
- Entering the ADJ menu again.
- Entering an adjustment of +50 (to return to center mass).
- Determining the BP and compares it to the initial BP, they should be to within 10 meters of each other.

(b) 200-meter zone.

- Entering the ADJ menu.
- Entering an adjustment of +50 (halfway to the far edge).
- Writing down all the firing data.
- Entering the ADJ menu again.
- Entering an adjustment of +50 (far edge).
- Writing down all the firing data.
- Entering the ADJ menu again.
- Entering an adjustment of -150 (halfway to the near edge).
- Writing down all the firing data.
- Entering the ADJ menu again.
- Enter an adjustment of -50 (near edge).
- Writing down all the firing data.
- Entering an adjustment of +100 (to return to center mass).
- Determining the BP and compares it to the initial BP, they should be to within 10 meters of each other.

(3) Once the FO gives the FFE, the computer proceeds as follows to establish the 100-meter zone:

(a) Firing without extension. Add and subtract 3/8 charge from the base command charge. (The base command charge is the command charge in the FFE center mass of target.) This gives each mortar three rounds with a different charge on each to cover the 100-meter zone (Figure 8-7).

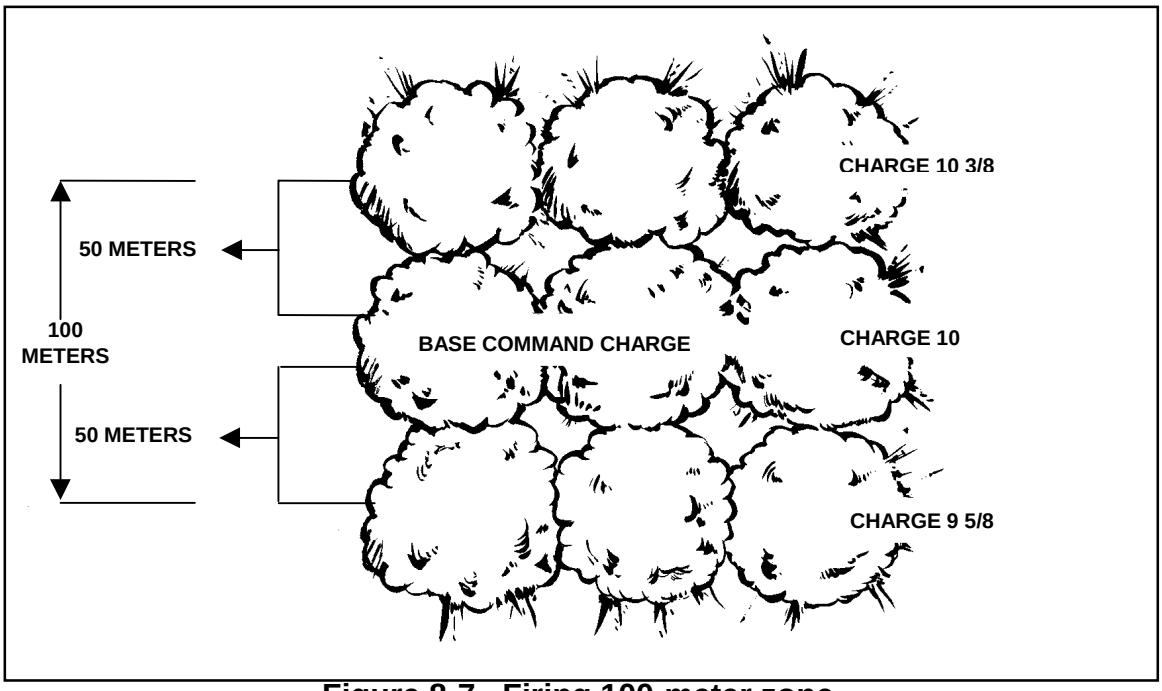


Figure 8-7. Firing 100-meter zone.

(b) Firing with extension. Add and subtract 4/8 charge from the base command charge and use three rounds for each mortar.

NOTE: A 3/8 charge correction to any charge without extension moves the round about 50 meters at any elevation used. A 4/8 charge correction to any charge with extension moves the round about 50 meters at any elevation used.

(c) Firing the 100-meter zone. Once the mortars are up (rounds set for proper charges) and the fire command is given, the rounds are fixed in any sequence—for example, No. 1 fires long, short, center mass; No. 2 fires center mass, short, long.

(4) Once the FFE has been given by the FO, the computer proceeds as follows to establish the 200-meter zone:

(a) Firing without extension. Add and subtract 3/8 charge from the base command charge for the rounds on either side of the base round and 6/8 charge for the long and short round (Figure 8-8).

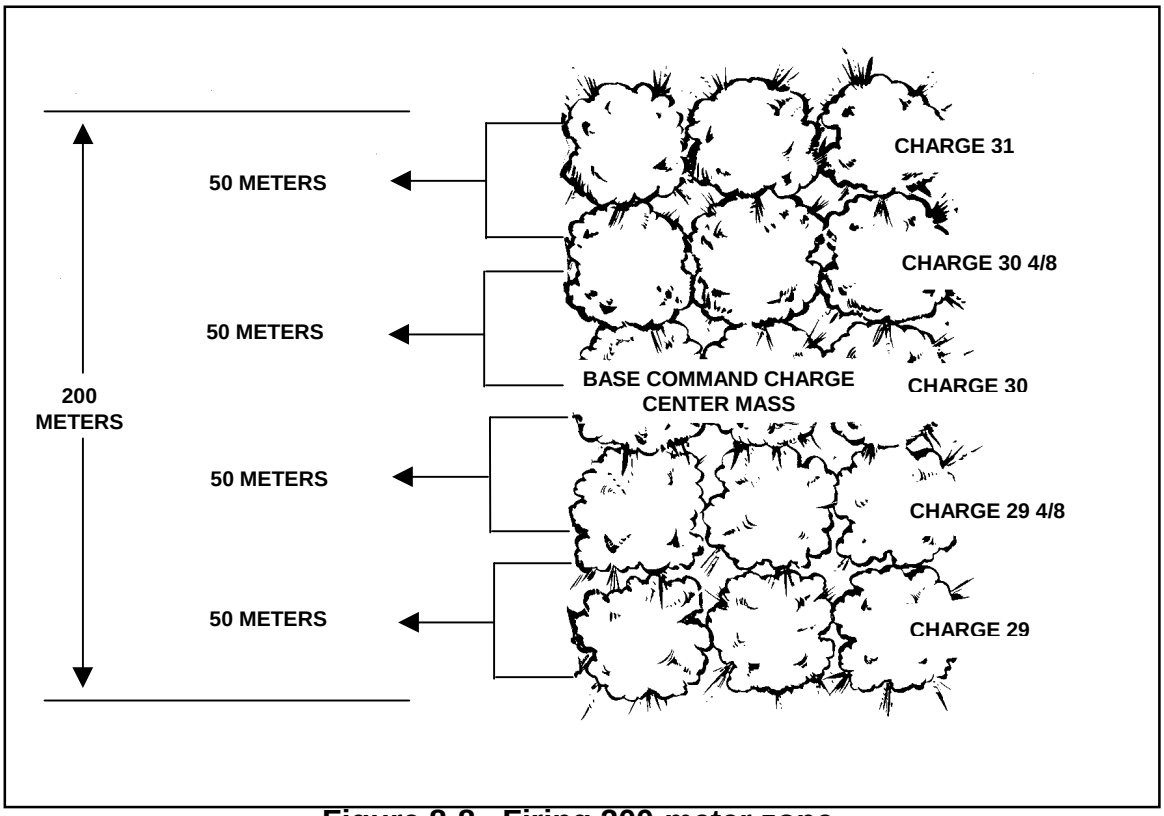


Figure 8-8. Firing 200-meter zone.

(b) Firing with extension. Add and subtract 4/8 charge from the base command charge for the rounds on either side of the base round and a whole charge for the long and short rounds.

(c) Firing the 200-meter zone. The mortars can fire the rounds in any sequence.

NOTES: 1. If a larger zone is needed, use the same procedures, only firing more rounds for each mortar and cutting the charges.
2. A 2/8 of a charge should be used with the M329A2 ammunition.

8-8. ILLUMINATION

Illumination assists friendly forces with light for night operations.

a. The FDC routinely obtains firing data. However, the FDC uses one of the flank mortars to adjust the illumination, leaving the base mortar ready to adjust HE rounds if a target is detected.

NOTE: Normally, when a four-mortar section is firing, the No. 4 mortar is used to adjust the illumination, leaving the No. 2 mortar as the base mortar. When the No. 1 mortar is used to adjust illumination, the No. 3 mortar becomes the base mortar.

b. The FO makes range and deviation corrections for illumination rounds in not less than 200-meter increments. He also makes corrections for height of burst (up or down) of not less than 50-meter increments.

c. Multiple mortar illumination procedures are used when single mortar illumination does not light up the area enough. Two mortars are used to fire illumination only when visibility is poor. Two mortars, usually side by side (No. 1 and 2, No. 2 and 3, and so on), fire rounds at the same time at the same deflection, charge, and time setting to provide a large amount of light in a small area. If the FO suspects a large target or if he is uncertain of target location and desires a larger area be illuminated, he may call for illumination: range, lateral, or range-lateral spread.

(1) *Range spread*. Two mortars fire one round each at the same deflection but with different charges so that rounds burst at different ranges along the same line. The spread between the rounds depends on the type of mortar firing the mission. The 120-mm rounds have 1,500 meters between bursts, the 4.2-inch mortar rounds have 1,000 meters between bursts, and the 81-mm mortar rounds have 500 meters between bursts. When four mortars are present in the firing section, the No. 2 and No. 3 mortars normally fire the range spread. When firing a three-mortar section, the range spread may be fired with just one mortar, which fires both rounds.

(a) Enter the type of target location called in by the FO into the MBC to initiate the mission. The weapon selected by the FDC in the WPN/AMMO menu (to activate the section) should be one of the mortars that is going to fire the mission.

(b) The initial firing data determined for the mission are center-of-mass target data. These data are not fired but are used as the starting point for the adjustment of the spread.

(c) Enter the ADJ menu. Change the OT direction to GT direction and enter a correction for the first round of the spread. Compute the firing data and record.

(d) Select the ADJ menu and enter a correction to get the required distance between rounds, which depends on the mortar system being used.

(e) Compute for firing data, record it, and fire the two rounds for the range spread.

NOTE: The two rounds should burst at the same time. The far round must be fired first, with the near round being fired after, at the difference between the time settings.

EXAMPLE

Assume the mortar selected to fire is the No. 2 mortar. Enter the initial target location and determine the center mass data. Next, enter the ADJ menu and give the No. 2 mortar a correction of +500 (for 4.2-inch mortars), +250 (for 81-mm mortars), or +750 (for 120-mm mortars). Compute these data and record them. Enter the ADJ menu again and make a correction of -1000 (for 4.2-inch), -500 (for 81-mm mortar), or -1500 (for 120-mm mortar). Compute and record these data. Using both sets of data to fire the rounds, rounds will burst the desired length (1,500 meters for the 120-mm, 1,000 meters for the 4.2-inch, or 500 meters for the 81-mm) between rounds on the GT line.

NOTE: A range spread should be fired using one mortar firing both rounds—one long and one short.

(2) *Lateral spread.* Two mortars fire one round each at different deflections but with the same charge. Therefore, the rounds burst at the same range along the same attitude.

(a) Using the No. 2 mortar, process the call for fire and determine firing data for center mass.

(b) Using the ADJ menu to enter left and right corrections, use the GT as the direction and enter the first correction.

NOTE: The No. 2 mortar is used for the initial round. The first correction can be either a right or left correction. For example, the first correction for the 4.2-inch mortar is R 500; the first correction for the 81-mm mortar round is L 250; the first correction for the 120-mm mortar round is L/R 750.

(c) Compute for the firing data and copy it down.

(d) Select the ADJ menu and enter the reverse of the first correction the entire distance required between rounds: L/R 1,000 meters for the 4.2-inch, L/R 500 meters for the 81-mm mortar, or L/R 1,500 meters for the 120-mm mortar.

(3) *Range-lateral spread*. If the target area is extremely large or if visibility is limited, the FO may call for range-lateral spread. This procedure combines the two methods (Figure 8-9). This results in a large diamond-shaped pattern of bursts. If mortars use the flank mortars for the lateral spread and the center mortar(s) for the range spread, the danger of rounds crossing in flight is removed.

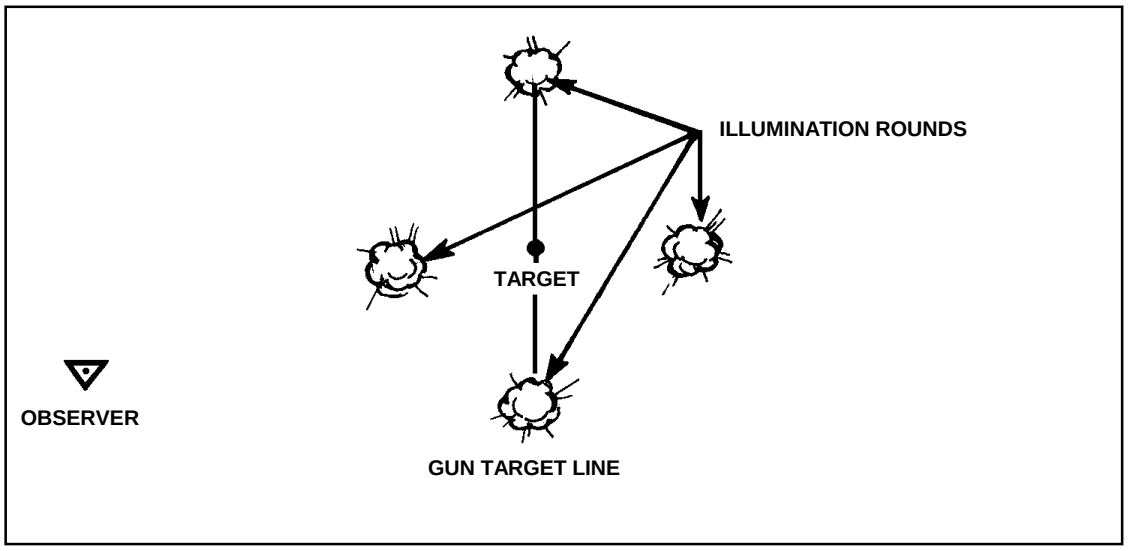


Figure 8-9. Range-lateral spread.

8-9. COORDINATED ILLUMINATION

When a suspected area is illuminated and produces a target, coordinated illumination is used to engage the target.

a. The illumination round has been adjusted over the target area. The computer receives a call for fire for a coordinated illumination.

b. The mark method is the method used most. The FDC and the FO must know which round the illumination mark will be given.

c. When the illumination round has been adjusted to provide the best light on the target, the FO gives the command, MARK ILLUMINATION. The FDC times the flight of the round from the time it is fired, until the command, MARK.

d. When determining the time to fire the HE round, drop all tenths before computations are made. Subtract the time of flight for the HE round and the illumination round.

EXAMPLE

ILLUMINATION ROUND—53 SECONDS AND THE HE ROUND—19 SECONDS = TIME TO FIRE THE HE ROUND WILL BE 34 SECONDS, AFTER THE ILLUMINATION ROUND IS FIRED.

e. When firing coordination missions, the computer operator uses a new computer record to record the illumination mission. The data that was used to fire the first illumination round is taken from the computer record that was used to adjust the illumination mission.

f. The FO sends corrections and precedes each correction with the type of round the correction is intended for—for example, ILLUMINATION, UP FIVE ZERO, HE, RIGHT FIVE ZERO, ADD FIVE ZERO. He records each correction on separate lines. The FDC keeps track of the 50-meter increments by using the computer record of the illumination mission.

g. There are two methods normally used to adjust illumination and HE. *Coordinated illumination using the mark method* with the FDC controlling the firing of both the HE and illumination rounds and *coordinated illumination using shell* at the FO commands. The FO controls the firing of each round. The FO sends corrections and computes the data that is sent to the mortars from the FDC. The mortars then report when they are UP. The FDC notifies the FO, and the FO gives the command to fire each round.

h. When the FO is certain that he can hit the target with the next round, he commands, CONTINUOUS ILLUMINATION, FIRE FOR EFFECT or CONTINUOUS ILLUMINATION, HE, DROP TWENTY-FIVE, FIRE FOR EFFECT.

i. By requesting the continuous illumination, the FO is telling the FDC that he wants the target illuminated during the fire for effect and illuminated afterward to allow him to make his target surveillance. Upon completion of the mission, he records the data on the data sheet.